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**Research & Commercialization Board Awards \$1.3 Million for
Clean Coal & Renewable Resources, Laser Optics,
Biotechnology, and Production Agriculture Projects**

(HELENA) – The Montana Board of Research and Commercialization Technology is awarding a total of \$1.3 million in research grants to 14 research projects in Billings, Bozeman, Butte, Great Falls, Missoula and Whitefish.

“It is critical for Montana to invest in research, commercialization and technology projects that broaden Montana’s education and job opportunities,” said Dore Schwinden, Director of the Montana Department of Commerce. “This investment helps to diversify our economy and allows Montana to compete in the global marketplace.”

The Board supports economic development by investing in research projects that have a clear path to commercialization. It has funded 181 research projects totaling \$36.5 million since 2001. The Board is attached to the Montana Department of Commerce.

“We are pleased to announce that the Research and Commercialization Technology program has funded 14 new projects,” said Dave Desch, Executive Director of the Board. “Many previously funded projects have resulted in the commercialization of products. These projects have the potential to significantly improve Montana’s opportunities for economic growth.”

“These newly awarded projects will receive an additional \$41.6 million in matching funds as leverage,” said Schwinden. “Since the program’s inception, Board funded

projects have also attracted \$229 million in follow-on funding. These projects are an investment in Montana's technology future and in the tech companies that develop around this research activity."

The grant awardees are:

C5-C7 Value Added "Montana Specialty Alkanes", Montana Refining Company, Great Falls - \$190,000 Awarded

Montana Refining Company and Brix-Berg, a Montana Research and Development Company, have formed a project team to investigate and develop cost effective technologies to isolate, concentrate, and purify light alkanes and alkane isomers from petrochemical streams within the refinery. These value-added alkanes may be utilized in a variety of ways including improving oil recoveries from existing oil producing formations – to vegetable oil extraction from soybeans, canola seed, sunflower seed and camelina seed. In addition, an anticipated emerging industry in Montana's energy sector, biofuels via microalgae, is based on extracting oils from microalgae using hexane. The project objective is to convert a portion of lower value petroleum products to higher value extraction solvents to support the developing biofuels industry sector. The potential sales/exports of the solvent to the U.S. and Canadian markets has the potential to drive capital investments within Montana of \$2-5 million with potential sales nearing \$10 million annually.

Commercialization of Optical Analog Waveform Generation (OAWG) Hardware, S2 Corporation, Bozeman - \$83,706 Awarded

S2 Corporation aims to commercialize its innovative approach to optical arbitrary waveform generation (OAWG) with a technique that is relatively simple and elegant in design, and with the potential to far exceed other competing approaches. S2 Corporation and its research and development partner, Montana State University Physics Department, have recently filed a joint provisional patent on the technique. This technology is also being developed under a Defense Advanced Research Projects Agency (DARPA) Phase 2 Small Business Innovative Research (SBIR) contract. The Board's award will support continued research and development efforts aimed at surpassing the specifications possible from other approaches, developing a well-documented set of product specifications supported by marketing literature, gathering potential end user input and commercialization support via sales, or licensing, or both. The OAWG approach exploits the unique spectral storage capabilities of a fiber optical ring cavity. The product is, in essence, a fiber optical photonic hardware apparatus that creates high bandwidth optical arbitrary waveforms over long time durations. Other OAWG systems suffer from several limitations, including relatively short duration for non-repetitive waveforms, slow refresh rates, and relatively small number of independently controlled frequency channels. For this technology, S2 Corporation speculates that up to 100 GHz of bandwidth can be achieved along with microsecond time delays (much longer than other approaches), giving a potential x1,000 factor of improvement over other approaches. Optical arbitrary waveforms have a wide range of military and commercial applications, including electronic countermeasures, optical code-division-multiple-access (CDMA) communications systems, synthetic

aperture radar (SAR) and laser radar, and low probability of intercept (LPI) radar, laser and optical communications.

Second Phase Clinical Trials of a Lypolytic Compound, All American Pharmaceutical, Billings - \$25,000 Awarded

Within the scope of this project, All American Pharmaceutical will seek to identify the biochemical functionality of a new lypolytic compound, and its effective dose and usage. This new lypolytic compound will be used to lower cholesterol levels in humans and will be sold over the counter.

Intelligent Proppant (iProppant™) – Activation of Solid State Reaction Mechanisms in Ceramic Proppant Material as a Method to Modify Fracture Path Flow – eProcess Technologies U.S., Butte - \$50,000 Awarded

eProcess Technologies in Butte proposes the development of a new class of oil and gas stimulation fracture proppant with unique characteristics which will aid in the enhanced recovery of oil and gas. Observations from other industries have shown a group of solid-state compounds with unique characteristics which can actively move, fill, or grow under certain circumstances. This has provided exciting insights into the potential constructive uses of these compounds in stimulating oil and gas production. This new class of proppant would have a tailored response that may include increasing or reducing overall fluid flow rate, isolation of a high water producing fracture zone, or release of a specific chemical or device. The world market for proppant materials is approximately \$1.5 billion, with the U.S. comprising about 20% of total sales. The goal is to capture a portion of this market by building on Montana's engineering and materials infrastructure.

Development of Ammonia Based Fuels for Environmentally Friendly Power Generation, David Micheletti, Montana Aerospace Development Association, Butte - \$111,500 Awarded

The Montana Aerospace Development Association (MADA) and its partner, SPG, Inc., will be developing and testing Ammonia as an alternative "green-fuel" for electric power generation applications at the Butte AeroTec Facility located near Butte. Ammonia is believed to be an attractive alternative fuel for power generation due to its high hydrogen density and absence of carbon. Additionally, Ammonia production could take place at existing wind or solar energy farms and transported to central power generation stations, thereby addressing the "stranded-power" issues associated with both wind and solar energy. MADA and SPG are currently conducting both Hybrid Rocket and Solid Fuel RamJet development/testing projects at Butte AeroTec. This new project will leverage Butte AeroTec's existing test infrastructure.

Neuroprotective Treatment for Traumatic Brain Injury, University of Montana, Missoula - \$60,000 Awarded

Over 1.5 million American suffer from traumatic brain injury (TBI) every year with an

estimated annual cost of \$48.3 billion. Montana ranks second in the U.S. for TBI per capita. In addition, TBI has become one of the signature injuries for military personnel returning from Iraq and Afghanistan. Unfortunately, there are currently no therapeutic treatments available to prevent the neuronal damage and loss that occurs as a consequence of TBI. It is estimated that such a therapeutic treatment could generate annual gross sales in the range of \$2 billion. We have recently discovered that low dose methamphetamine can be used as an acute treatment to protect neurons after TBI. The current MBRCT funding will support preclinical studies needed to obtain FDA approval for a Phase II clinical trial in humans. The goal is to begin Phase II trials in 2011.

Enhancement of Applied Research in Biomedicine, University of Montana, Missoula - \$161,344 Awarded

The goal of this project is to continue building an applied/translational biomedical research enterprise in the study and treatment of diseases of the nervous system. This effort is intended to directly promote interactions between university researchers, hospital clinicians and private sector biotech/biomedical companies in a manner that positively impacts the state's economy. The project leverages grant support provided for basic neuroscience research by the National Institutes of Health (NIH) to the University of Montana's Center of Biomedical Research Excellence (COBRE) in Structural and Functional Neuroscience (\approx \$10 million from 2005-2010). Scientists participating include those affiliated with the Center, as well as those in private sector research entities, such as St. Patrick Hospital and Health Sciences Center and emerging Biotech companies in Montana. An additional collaborative effort is now in place involving faculty and students from the UM School of Business Administration. A strong emphasis is placed on the development of novel diagnostics, devices and/or therapeutic agents related to the treatment of brain injury or disease. In the past few years, these efforts have led to the development of numerous patents and the establishment of four biotech spin-off companies in Montana. The award will be used to support a number of endeavors, including: seed projects to develop, refine, and protect intellectual property that will be commercialized in the private sector, the development of incubator space for Small Business Innovation Research (SBIR) projects, the maintenance of high-tech, high-cost shared instrumentation as a statewide research resource, the training of students, and the continued promotion of collaborative projects between Center researchers and biotech/biomedical companies in Montana.

MEMS-Based Micro Zoom Lens for Cell Phone Cameras, Bridger Photonics, Bozeman - \$100,135 Awarded

Bridger Photonics, Inc. and Montana State University have developed a novel mirror that is flexible and can be deformed into a curved shape to focus light simply by applying a voltage and without mechanical motion. The technology is based on advanced micro-electro-mechanical systems (MEMS), which can be mass produced lithographically with extremely small size, with incredible precision and accuracy and at low cost. Bridger Photonics plans to use this technology to make a compact zoom lens with no moving parts for cell phone cameras. Optical zoom lenses are not currently available for cell

phone cameras because conventional zoom systems require the physical translation of multiple lenses and are therefore incompatible with the extremely compact size of cell phones. However, Bridger Photonics and MSU have demonstrated that the MEMS technology can achieve compact focus control with no mechanical movement and thus overcome these traditional barriers. As nearly all cell phones are equipped with cameras, Bridger Photonics estimates the market potential for this technology at greater than \$1 billion per year.

Continued Development of Applications for Inhibitors of Fungal Morphogenesis, Montana State University Billings, Billings - \$100,000 Awarded

Human fungal infections are commonly caused by *C. albicans*. This organism is a major fungal pathogen. Studies indicate that up to 75 percent of women suffer from infections tied to *C. albicans*. Approximately 10,000 people die each year from such infections. In many healthy humans, *C. albicans* exists in our bodies in a balanced state that does us no harm. One important aspect of infections by *C. albicans* is that it forms tubes that spread unchecked and eventually lead to tissue destruction. This project involves using a drug (BH3I-1) to block the spread and potentially stop the infection. The researchers are developing BH3I into a commercial laboratory reagent for understanding the spread of the infection, and exploring its potential as a novel drug to treat infections.

Manufacture of Wavefront Guided Progressive Multifocal Contact Lens, WaveSource, Inc., Whitefish - \$87,633 Awarded

WaveSource, Inc. is developing multifocal soft contact lenses to improve non-surgical vision for millions of people who require vision correction. Currently, commercially available multifocal contact lenses do not correct high order aberrations and have limited success (typically less than 30% success rate) in providing a solution for near vision correction. Through its advanced lens design and fitting software, WaveSource takes highly accurate optical measurements of the eye and generates a lens that is personalized for every individual. In conjunction with Montana State University, Spectrum Labs, this project will advance current laser based technologies providing measuring systems for these complex optical surfaces. When combined with the WaveSource simplified fitting and design software, eye care practitioners will correct their patients to a much higher level of accuracy therefore providing improved visual clarity.

An Integrated Platform for Cell-Based Drug Discovery, Montana Molecular, Bozeman - \$99,935 Awarded

This project will be performed collaboratively by Fluorescence Innovations and Montana Molecular, who have joined forces in a shared facility located in Bozeman. The primary aim is to validate an integrated drug discovery platform that combines high throughput instrumentation with genetically encoded fluorescence sensors in a cell-based format. The platform will enable extremely fast and specific assays for drug activity, which meet the pharmaceutical industry's urgent demand to improve the efficiency and reduce the cost of drug discovery.

Hard White Wheat: Jump-Starting a New Industry for Montana Agriculture, Montana State University, Bozeman - \$140,000 Awarded

Options for diversification of Montana's wheat-based farming systems are limited by dry conditions and short growing seasons. One attractive possibility is the development of specialty hard white wheat varieties that will complement the traditional hard red wheat, thus providing access to new markets. The recent development of molecular markers by MSU researchers for seed color genes has allowed rapid conversion of the best red-seeded varieties to white-seeded types. These new lines will be tested for end-use quality properties and on-farm performance, with the goal of releasing a superior hard white wheat variety for Montana growers and end-users. This project has the potential to add much needed diversification to Montana's agricultural base.

Nanoparticle-Bacteriophage Cocktails to Combat Infectious Disease, Montana Tech/Montana State University, Butte/Bozeman - \$113,050 Awarded

Recent increases in infections by antibiotic-resistant bacteria, such as methicillin resistant *Staphylococcus aureus* (MRSA), represent an enormous challenge to the medical and pharmaceutical communities. It has been known for some time that certain viruses (bacteriophages) specifically infect and kill several classes of bacteria that are resistant to antibiotics. At the same time, these viruses that are lethal to bacteria cannot infect human cells and therefore do not pose any threat to humans. The goal of this project is to employ novel viruses that the researchers have recently discovered to combat serious bacterial infections that are otherwise untreatable using existing antibiotics. They have now demonstrated that the combination of these viruses and very small synthetic particles (nanoparticles), made in their labs, enhances the viruses' killing rate of bacteria. The idea is that combining nanoparticles and several different bacteriophages, that infect the same bacterial species, will result in extremely effective treatments that have potential for low-cost clinical translation.

Integration of Passive Seismic, Electrical and Temperature Measurements for Geothermal Resource Exploration, Montana Tech, Butte - \$53,760 Awarded

The Geophysical Engineering Department at Montana Tech and Gradient Geophysics of Missoula will team up to investigate new methods for exploring for geothermal resources. The group will collect three different types of geophysical data including electrical, seismic, and temperature over the geothermal resource area at Fairmont Hot Springs. To interpret these data, an artificial neural network (ANN) will be devised which will simulate the biological learning process. The ANN will be trained on hundreds of geologic models simulated at the Rocky Mountain Supercomputing Center. These models will enable the ANN to "learn" the seismic, electrical, and temperature signatures of geothermal reservoirs. Once the method is fine tuned at Fairmont, it will be applied at other areas across Montana and the western U.S. to locate geothermal resources.

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